

Summary

A systematic review of new epidemiologic evidence adds new inferences for a causal relationship between smoking and a number of cancers. This report draws several new conclusions. Specifically, it concludes that evidence is sufficient to infer a causal relationship between smoking and cancers of the cervix, kidneys, pancreas, and stomach. Also, it infers a

causal relationship between smoking and acute myeloid leukemia. Although there is evidence that smoking is not related to the risk of developing prostate cancer, this report also concludes that it is probable that smoking contributes to a higher mortality rate from prostate cancer. Finally, this report concludes that active smoking is not causally related to breast cancer.

Conclusions

Lung Cancer

1. The evidence is sufficient to infer a causal relationship between smoking and lung cancer.
2. Smoking causes genetic changes in cells of the lung that ultimately lead to the development of lung cancer.
3. Although characteristics of cigarettes have changed during the last 50 years and yields of tar and nicotine have declined substantially, as assessed by the Federal Trade Commission's test protocol, the risk of lung cancer in smokers has not declined.
4. Adenocarcinoma has now become the most common type of lung cancer in smokers. The basis for this shift is unclear but may reflect changes in the carcinogens in cigarette smoke.
5. Even after many years of not smoking, the risk of lung cancer in former smokers remains higher than in persons who have never smoked.
6. Lung cancer incidence and mortality rates in men are now declining, reflecting past patterns of cigarette use, while rates in women are still rising.

Laryngeal Cancer

7. The evidence is sufficient to infer a causal relationship between smoking and cancer of the larynx.

8. Together, smoking and alcohol cause most cases of laryngeal cancer in the United States.

Oral Cavity and Pharyngeal Cancers

9. The evidence is sufficient to infer a causal relationship between smoking and cancers of the oral cavity and pharynx.

Esophageal Cancer

10. The evidence is sufficient to infer a causal relationship between smoking and cancers of the esophagus.
11. The evidence is sufficient to infer a causal relationship between smoking and both squamous cell carcinoma and adenocarcinoma of the esophagus.

Pancreatic Cancer

12. The evidence is sufficient to infer a causal relationship between smoking and pancreatic cancer.

Bladder and Kidney Cancers

13. The evidence is sufficient to infer a causal relationship between smoking and renal cell, renal pelvis, and bladder cancers.

Cervical Cancer

14. The evidence is sufficient to infer a causal relationship between smoking and cervical cancer.

Ovarian Cancer

15. The evidence is inadequate to infer the presence or absence of a causal relationship between smoking and ovarian cancer.

Endometrial Cancer

16. The evidence is sufficient to infer that current smoking reduces the risk of endometrial cancer in postmenopausal women.

Stomach Cancer

17. The evidence is sufficient to infer a causal relationship between smoking and gastric cancers.
18. The evidence is suggestive but not sufficient to infer a causal relationship between smoking and noncardia gastric cancers, in particular by modifying the persistence and/or the pathogenicity of *Helicobacter pylori* infections.

Colorectal Cancer

19. The evidence is suggestive but not sufficient to infer a causal relationship between smoking and colorectal adenomatous polyps and colorectal cancer.

Prostate Cancer

20. The evidence is suggestive of no causal relationship between smoking and risk for prostate cancer.
21. The evidence for mortality, although not consistent across all studies, suggests a higher mortality rate from prostate cancer in smokers than in non-smokers.

Acute Leukemia

22. The evidence is sufficient to infer a causal relationship between smoking and acute myeloid leukemia.
23. The risk for acute myeloid leukemia increases with the number of cigarettes smoked and with duration of smoking.

Liver Cancer

24. The evidence is suggestive but not sufficient to infer a causal relationship between smoking and liver cancer.

Adult Brain Cancer

25. The evidence is suggestive of no causal relationship between smoking cigarettes and brain cancer in men and women.

Breast Cancer

26. The evidence is suggestive of no causal relationship between active smoking and breast cancer.
27. Subgroups of women cannot yet be reliably identified who are at an increased risk of breast cancer because of smoking, compared with the general population of women.
28. Whether women who are at a very high risk of breast cancer because of mutations in *BRCA1* or *BRCA2* genes can lower their risks by smoking has not been established.